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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/748,279

12/31/2003

Kazuhiko Asakawa

OKI 398

6609

23995

7590

12/23/2004

RABIN & Berdo, PC
1101 14TH STREET, NW
SUITE 500
WASHINGTON, DC 20005

EXAMINER

NHU, DAVID

ART UNIT

PAPER NUMBER

2818

DATE MAILED: 12/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/748,279

Applicant(s)

ASAKAWA, KAZUHIKO

Examiner

David Nhu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 6-9 and 14-19 is/are allowed.
- 6) ☒ Claim(s) 1-5 and 10-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 01.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTIONS

Claims Objection

1. Claim 5, "the aperture of the insulation film" lacks a clear antecedent basis.

Claims 1, 6, 10, 14, delete "**a step**", for example, "a step of etching the insulating film" should be --etching the insulating film--

Claims 1, 10, "the element" should be --the semiconductor element--

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-4 are rejected under 35 U.S.C. 102 (b) as being anticipated by Liu (6,197,659 B1).

Regarding claim 1, Liu, (see figures 3A-3I, col. 4, lines 30-67, col. 5, lines 1-67), teaches a method for manufacturing a semiconductor element using shallow trench isolation (STI), comprising: forming, on a substrate 104, on which a protection oxide film 102 for protecting an active region 110 and a nitride film 106 to be used as an etching stopper are formed in this order, an insulation film 126 for protecting the nitride film; etching the insulation film, the nitride film, the protection oxide film, and the substrate on the semiconductor element separation region to form a trench 130; etching the insulation film to widen its aperture 112 toward an inside of the active region; performing a heat treatment to form a thermal oxidation (RTO) film 140 inside the trench; etching the nitride film using the insulation film with the widened aperture

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as a mask to move a step defined by the thermal oxidation film and the nitride film from upper edge 120 of the trench toward the inside of the active region; forming a filling oxide film 144 for burying the trench; selectively etching the filling oxide film and the insulation film to expose the nitride film; etching the filling oxide film inside the trench so that a surface of the substrate is substantially level with a surface of the filling oxide film; and removing the nitride film 106 and the protecting oxide film 102.

Regarding claims 2-4, (see figures 3A-3I, col. 1-8), Liu also teach the insulation film is oxide; the selective etching for the filling oxide film and the insulation film is chemical mechanical polishing (CMP); the nitride film scarcely etched in the selective etching for the filling oxide film and the insulation film.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

5. Claims 10-13 are rejected under 35 U.S.C. 102(e) as being anticipated by Doong (6,740,592 B1).

Regarding claim 10, Doong, (see figures 1-8, col. 2, lines 35-67, col. 3, lines 1-49), teaches a method for manufacturing a semiconductor element using STI, comprising: forming, on a substrate 10, on which a protection oxide film 12 for protecting an active region and a nitride

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film 14 to be used as an etching stopper are formed in this order, an insulation film 16 for protecting the nitride film; etching the insulation film, the nitride film, the protection oxide film, and the substrate on the semiconductor element separation region to form a trench 25; performing a heat treatment to form a thermal oxidation film 30 inside the trench; forming an oxide film 40 to used for forming spacers 36 on a whole surface of the substrate and then forming oxide film sidewall spacers having a step below the substrate surface by etching back the oxide film; forming a filling oxide film 40 for burying the trench; selectively etching the filling oxide film and the insulation film to expose the nitride film; etching the filling oxide film inside the trench and the oxide film sidewall spacers 36 so that the substrate surface is substantially level with a surface of the filling oxide film; and removing the nitride film and the protection oxide film.

Regarding claims 11-13, Doong, (see figures 1-9, col. 1-8), also teaches the insulation film is oxide; the selective etching for the filling oxide film 40 and the insulation film 16 is CMP; the nitride film 14 is scarcely etched in the selective etching for the filling oxide film and the insulation film.

Allowable Subject Matter

6. Claims 6-9, 14-19 are allowed.

The following is a statement of reason for the indication of allowance subject matter: Doong and Liu fail to teach a polysilicon film for protecting the nitride film; performing a heat treatment to form a thermal oxidation film inside the trench and to modify the polysilicon film into an oxide film; forming a polysilicon film on a whole surface of the substrate to form polysilicon fil sidewall spacers on a sidewall of the trench by etching back the polysilicon film, the spacers having a

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step below the substrate surface; performing a heat treatment to modify the polysilicon film sidewall spacers into oxide film sidewall spacers (as cited in claims 6, 14).

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: Tseng'813, Beyer'951, Cha'797, Kim'710, Ballantine'018 are cited as of interest.

8. A shortened statutory period for response to this action is set to expired 3 (three) months and 0 (zero) day from the date of this letter. Failure to respond within the period for response will cause the application to become abandoned(see 710.02 (b)).

9. Any inquiry concerning this communication on earlier communications from the examiner should be directed to David Nhu (571)272-1792. The examiner can normally be reached on Monday-Friday from 7:30 AM to 5:00 PM. The examiner's supervisor, David Nelms can be reached on (571)272-1787.

The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Information regarding the status of an application may be obtained from the patent application information retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR

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system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

David Nhu



December 19, 2004